

## IO-Link Interface Description

### ThinkTop V70 IO-Link



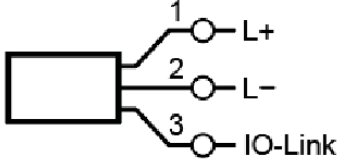



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## 1 Device variant

<p><b>ThinkTop V70 IO-Link</b></p> <p>Valve Control Unit</p>		
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## 2 Communication

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Vendor ID	0x050C 1292 d / Bytes 5d 12d
Device ID	0x0002 2 d / Bytes 0d 2d
Bit rate	COM2
Minimum cycle time	5 ms
SIO mode supported	No
Block parameterization	Yes
Data storage	Yes
Supported profiles	BLOB, Binary Large Objects Identification and Diagnosis
Supported Control Board revision	AA to AD



**NOTE:**

If the Vendor ID and Device ID is referenced in your PLC system, then it is ensured that

- the connected Device type is correct
- the IO-Link datastorage is enabled
- your application is still able to work, even your Device has been exchanged with a successor model.



For process value update rate, as well as further information concerning sensor performance, see product leaflet



### 3 Parameter overview

Parameter	Index	Subindex	Type	Factory setting	page
Device Access Locks	12		RecordT (16 Bit)	false	13
Vendor name	16		StringT (10 Byte)	Alfa Laval	8
Vendor text	17		StringT (17 Byte)	www.alfalaval.com	8
Product Name	18		StringT (20 Byte)	ThinkTop V70 IO-Link	8
Product ID	19		StringT (20 Byte)	ThinkTop V70 IO-Link	8
Product Text	20		StringT (31 Byte)	Control board SP no. 9615394801	8
Hardware Version	22		StringT (2 Byte)		14
Firmware Version	23		StringT (16 Byte)		14
Application Specific Tag	24		StringT (32 Byte)	***	8
Function Tag	25		StringT (32 Byte)	***	8
Location Tag	26		StringT (32 Byte)	***	8
Process data input	40		RecordT (32 Bit)		9
Process data output	41		RecordT (8 Bit)		10
BLOB ID	49		IntegerT (16 Bit)	0 (Idle)	17
Production date	65		StringT (4 Byte)		14
Valve Type	66		UIntegerT (8 Bit)		13
Setup Type	67		UIntegerT (8 Bit)		13
Error Modifier	70		IntegerT (8 Bit)	10	11
Power Save	73		UIntegerT (8 Bit)	0 (Disabled)	11
RGB-Colour	74		RecordT (64 Bit)		12
Button press	74	1	UIntegerT (8 Bit)	5 (Purple)	
Error	74	2	UIntegerT (8 Bit)	4 (Red)	
Out	74	3	UIntegerT (8 Bit)	0 (RGB off)	
De-En	74	4	UIntegerT (8 Bit)	2 (Green)	
Main	74	5	UIntegerT (8 Bit)	7 (White)	
Usl	74	6	UIntegerT (8 Bit)	3 (Cyan)	
Lsp	74	7	UIntegerT (8 Bit)	6 (Yellow)	
Wink	74	8	UIntegerT (8 Bit)	5 (Purple)	
USA Bit Mapping	75		UIntegerT (8 Bit)	0 (USA bit mapping disabled)	11
Key Lock	76		UIntegerT (8 Bit)	0 (Unlocked)	13
Burst Clean	77		UIntegerT (8 Bit)	0 (Disabled)	11
Log	80		RecordT (96 Bit)		14
PowerUps	80	1	IntegerT (32 Bit)		
RunTime	80	2	IntegerT (32 Bit)		
LastCustomisation	80	3	IntegerT (32 Bit)		
Temperature	81		RecordT (48 Bit)		14
Current	81	1	IntegerT (16 Bit)		
Min	81	2	IntegerT (16 Bit)		
Max	81	3	IntegerT (16 Bit)		
Pressure Shock Counter	82		IntegerT (32 Bit)	0	14
SV-activations	83		RecordT (96 Bit)		15
SV1	83	1	IntegerT (32 Bit)	0	
SV2	83	2	IntegerT (32 Bit)	0	
SV3	83	3	IntegerT (32 Bit)	0	
SV-ON_time	84		RecordT (96 Bit)		15



### 3 Parameter overview

Parameter	Index	Subindex	Type	Factory setting	page
SV1	84	1	IntegerT (32 Bit)	0	
SV2	84	2	IntegerT (32 Bit)	0	
SV3	84	3	IntegerT (32 Bit)	0	
Setup En-stroke	85		RecordT (96 Bit)		16
SV1 (main)	85	1	IntegerT (32 Bit)	0	
SV2 (USL)	85	2	IntegerT (32 Bit)	0	
SV3 (LSP)	85	3	IntegerT (32 Bit)	0	
Setup DeEn-stroke	86		RecordT (96 Bit)		17
SV1	86	1	IntegerT (32 Bit)	0	
SV2	86	2	IntegerT (32 Bit)	0	
SV3	86	3	IntegerT (32 Bit)	0	
Setup Position Data (De...)	110		RecordT (32 Bit)		15
Pos De-En	110	1	UIntegerT (16 Bit)		
Switchpoint logic	110	2	BooleanT		
Switchpoint hystere...	110	3	UIntegerT (8 Bit)		
Setup Position Data (Ma...)	111		RecordT (48 Bit)		16
Pos Main	111	1	UIntegerT (16 Bit)		
Switchpoint logic	111	2	BooleanT		
Switchpoint hystere...	111	3	UIntegerT (8 Bit)		
Setup Position Data (Lsp)	112		RecordT (32 Bit)		16
Pos Lsp	112	1	UIntegerT (16 Bit)		
Switchpoint logic	112	2	BooleanT		
Switchpoint hystere...	112	3	UIntegerT (8 Bit)		
Setup Position Data (Usl)	113		RecordT (32 Bit)		16
Pos Usl	113	1	UIntegerT (16 Bit)		
Switchpoint logic	113	2	BooleanT		
Switchpoint hystere...	113	3	UIntegerT (8 Bit)		

## 4 System Commands



System Command information  
 - Address: Index 2, Subindex 0  
 - Datatype: UInteger (8 Bit)  
 - AccessRight: Write Only

System Commands	Text	Description
1	Upload Start	Start block parameter upload
2	Upload End	End block parameter upload
3	Download Start	Start block parameter download
4	Download End	Stop block parameter download
5	Store	Finalize block parameterization and start Data Storage
6	Break	Cancel block parameterization
130	Restore Factory Settings	
208	Start Auto Setup	
209	Setup Reset	
210	Parameter Reset	
211	Diagnostic Reset	
240	IO-Link 1.1 system test command 240, Event 8DFE appears	
241	IO-Link 1.1 system test command 241, Event 8DFE disappears	
242	IO-Link 1.1 system test command 242, Event 8DFF appears	
243	IO-Link 1.1 system test command 243, Event 8DFF disappears	



## 5 Identification

### 5.1 Identification

<b>Function Tag</b>	<b>Index 25</b>	<b>Subindex 0</b>	<b>StringT (32 Byte)</b>	<b>ReadWrite</b>
Description of the device function				
Factory setting	***			
<b>Location Tag</b>	<b>Index 26</b>	<b>Subindex 0</b>	<b>StringT (32 Byte)</b>	<b>ReadWrite</b>
Description of the physical device location				
Factory setting	***			
<b>Application Specific Tag</b>	<b>Index 24</b>	<b>Subindex 0</b>	<b>StringT (32 Byte)</b>	<b>ReadWrite</b>
Factory setting	***			
<b>Vendor name</b>	<b>Index 16</b>	<b>Subindex 0</b>	<b>StringT (10 Byte)</b>	<b>ReadOnly</b>
Factory setting	Alfa Laval			
<b>Product Name</b>	<b>Index 18</b>	<b>Subindex 0</b>	<b>StringT (20 Byte)</b>	<b>ReadOnly</b>
Factory setting	ThinkTop V70 IO-Link			
<b>Product ID</b>	<b>Index 19</b>	<b>Subindex 0</b>	<b>StringT (20 Byte)</b>	<b>ReadOnly</b>
Factory setting	ThinkTop V70 IO-Link			
<b>Product Text</b>	<b>Index 20</b>	<b>Subindex 0</b>	<b>StringT (31 Byte)</b>	<b>ReadOnly</b>
Factory setting	Control board SP no. 9615394801			
<b>Vendor text</b>	<b>Index 17</b>	<b>Subindex 0</b>	<b>StringT (17 Byte)</b>	<b>ReadOnly</b>
Factory setting	www.alfalaval.com			



## 6 Observation

### 6.1 Process Data Input/Output

Process data input		RecordT (32 Bit)
<b>Valve position</b>		<b>IntegerT (16 Bit)</b>
Current valve position. Represents the actual distance between the top of the valve actuator and the top of the valve stem.		
Value range [mm]	(0 To 1060) * 0.1 32764	(NoData)
<b>Error status</b>		<b>UIntegerT (5 Bit)</b>
Short description of the current error (Troubleshooting advice is available in the Instruction manual)		
Value range	0	(Everything is OK)
	16	(Sensor target missing (#16))
	17	(Setup prerequisite issue (#17))
	18	(Pneumatic part issue (#18))
	19	(Seat lift sensor issue (#19))
	20	(Position not reached (#20))
	21	(Unexpected movement (#21))
	22	(Seat-lift sensor missing (#22))
	23	(Pilot valve 1 missing (#23))
	24	(Pilot valve 2 missing (#24))
	25	(Pilot valve 3 missing (#25))
	26	(Interlock active (#26))
	27	(Hardware fault (#27))
	28	(Setup aborted (#28))
	29	(Blocked button (#29))
	30	(Communication failure (#30))
	31	(Safety stop active (#31))
<b>Valve state</b>		<b>BooleanT</b>
Current Valve state (The valve system is OK when the signal is high)		
Value range	false true	(Valve state NOT OK) (Valve state OK)
<b>LSP</b>		<b>BooleanT</b>
Lower Seat Push energised position		
Value range	false true	(inactive) (active)
<b>USL</b>		<b>BooleanT</b>
Upper Seat Lift energised position		
Value range	false true	(inactive) (active)
<b>MAIN</b>		<b>BooleanT</b>
Main energised Position		
Value range	false true	(inactive) (active)
<b>DE_EN</b>		<b>BooleanT</b>
De-Energized		
Value range	false true	(inactive) (active)

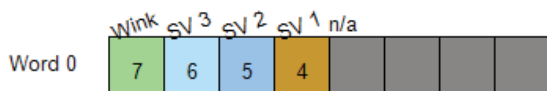


Process data displayed according device sort order.  
Please note: Siemens PLCs swap the high and low byte when using byte addressing.



## 6 Observation

Process data output		RecordT (8 Bit)
SV 1		BooleanT
Trigger solenoid valve 1 for main valve activation		
Value range	false true	(Disable) (Enable)
SV 2		BooleanT
Trigger solenoid valve 2 for upper seat lift activation		
Value range	false true	(Disable) (Enable)
SV 3		BooleanT
Trigger solenoid valve 3 for lower seat push activation		
Value range	false true	(Disable) (Enable)
Wink		BooleanT
Visual indication for locating the unit (Purple flashing as default)		
Value range	false true	(Disable) (Enable)



-n/a: Not available area. Used to cover structured process data mapping



## 7 Parameter

### 7.1 Parameterization

#### 7.1.1 Customisation

Burst Clean	Index 77	Subindex 0	UIntegerT (8 Bit)	ReadWrite
Burst clean mode. Independent fast seat-lift operation for effective cleaning				
<b>Factory setting</b>	<b>0</b>	<b>(Disabled)</b>		
Value range	0 1	(Disabled) (Enabled)		
USA Bit Mapping	Index 75	Subindex 0	UIntegerT (8 Bit)	ReadWrite
With this setting the seat-lift signals will represent seat closed position				
<b>Factory setting</b>	<b>0</b>	<b>(USA bit mapping disabled)</b>		
Value range	0 1	(USA bit mapping disabled) (USA bit mapping enabled)		
Power Save	Index 73	Subindex 0	UIntegerT (8 Bit)	ReadWrite
Power save mode will turn off the visual indication when the unit is idle				
<b>Factory setting</b>	<b>0</b>	<b>(Disabled)</b>		
Value range	0 1	(Disabled) (Enabled)		
Error Modifier	Index 70	Subindex 0	IntegerT (8 Bit)	ReadWrite
The 'position not reached' timeout of the surveillance mode feature is calculated by [stroke duration + error modifier], the error modifier can be modified				
<b>Factory setting</b>	<b>10</b>			
Value range	(1 To 60) [s]			
RGB-Colour	Index 74	Subindex 0	RecordT (64 Bit)	ReadWrite
Option for customisation of the colours for the visual feedback				
Button press		Subindex 1	UIntegerT (8 Bit)	
RGB colour for button press feedback				
<b>Factory setting</b>	<b>5</b>	<b>(Purple)</b>		
Value range	0 1 2 3 4 5 6 7	(RGB off) (Blue) (Green) (Cyan) (Red) (Purple) (Yellow) (White)		
Error		Subindex 2	UIntegerT (8 Bit)	
RGB colour for error feedback				
<b>Factory setting</b>	<b>4</b>	<b>(Red)</b>		
Value range	0 1 2 3 4 5 6 7	(RGB off) (Blue) (Green) (Cyan) (Red) (Purple) (Yellow) (White)		



## 7 Parameter

RGB-Colour	Index 74	Subindex 0	RecordT (64 Bit)	ReadWrite
Out		Subindex 3	UIntegerT (8 Bit)	
RGB colour for Moving (out of any position)				
<b>Factory setting</b>	<b>0</b>	<b>(RGB off)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		
De-En		Subindex 4	UIntegerT (8 Bit)	
RGB colour for De-Energized position				
<b>Factory setting</b>	<b>2</b>	<b>(Green)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		
Main		Subindex 5	UIntegerT (8 Bit)	
RGB colour for Main position				
<b>Factory setting</b>	<b>7</b>	<b>(White)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		
Usl		Subindex 6	UIntegerT (8 Bit)	
RGB colour for Upper Seat Lift position				
<b>Factory setting</b>	<b>3</b>	<b>(Cyan)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		
Lsp		Subindex 7	UIntegerT (8 Bit)	
RGB colour for Lower Seat Push position				
<b>Factory setting</b>	<b>6</b>	<b>(Yellow)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		
Wink		Subindex 8	UIntegerT (8 Bit)	
RGB colour for Wink signal				
<b>Factory setting</b>	<b>5</b>	<b>(Purple)</b>		
Value range	0	(RGB off)		
	1	(Blue)		
	2	(Green)		
	3	(Cyan)		
	4	(Red)		
	5	(Purple)		
	6	(Yellow)		
	7	(White)		



## 7 Parameter

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### 7.2 Setup

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Key Lock	Index 76	Subindex 0	UIntegerT (8 Bit)	ReadWrite
Locks the SELECT key on the local user interface to prevent unintentional changes, [Key Lock] is reset-table at the device.				
<b>Factory setting</b>	<b>0</b>	<b>(Unlocked)</b>		
Value range	0 1	(Unlocked) (Locked)		

Setup Type	Index 67	Subindex 0	UIntegerT (8 Bit)	ReadOnly
Type of current setup				
Value range	0 1 2 3	(No Setup) (Auto Setup) (Live Setup) (Flex Setup)		

Valve Type	Index 66	Subindex 0	UIntegerT (8 Bit)	ReadOnly
Detected or configured valve type				
Value range	0 1	(Rotary valve) (Seat valve)		

### 7.3 Extended Command

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Device Access Locks	Index 12	Subindex 0	RecordT (16 Bit)	ReadWrite
Data Storage Lock		bitOffset 1	BooleanT	
Local Parameterization Lock		bitOffset 2	BooleanT	
<b>Factory setting</b>	<b>false</b>			



## 8 Diagnosis

### 8.1 Diagnostics

<b>Production date</b>	<b>Index 65</b>	<b>Subindex 0</b>	<b>StringT (4 Byte)</b>	<b>ReadOnly</b>
Device production date (YYWW)				
<b>Hardware Version</b>	<b>Index 22</b>	<b>Subindex 0</b>	<b>StringT (2 Byte)</b>	<b>ReadOnly</b>
<b>Firmware Version</b>	<b>Index 23</b>	<b>Subindex 0</b>	<b>StringT (16 Byte)</b>	<b>ReadOnly</b>
<b>Log</b>	<b>Index 80</b>	<b>Subindex 0</b>	<b>RecordT (96 Bit)</b>	<b>ReadOnly</b>
Logging information				
PowerUps		Subindex 1	IntegerT (32 Bit)	
Number of power-cycles				
Value range	(0 To 2000000) * 1			
RunTime		Subindex 2	IntegerT (32 Bit)	
Number of operating hours				
Value range [h]	(0 To 2000000) * 1			
LastCustomisation		Subindex 3	IntegerT (32 Bit)	
Time since last tool parametrisation				
Value range [h]	(0 To 2000000) * 1			
<b>Temperature</b>	<b>Index 81</b>	<b>Subindex 0</b>	<b>RecordT (48 Bit)</b>	<b>ReadOnly</b>
Temperature monitoring				
Current		Subindex 1	IntegerT (16 Bit)	
Current core temperature				
Value range [°C]	(-20 To 100) * 1			
Min		Subindex 2	IntegerT (16 Bit)	
Minimum core temperature to date				
Value range [°C]	(-20 To 100) * 1			
Max		Subindex 3	IntegerT (16 Bit)	
Maximum core temperature to date				
Value range [°C]	(-20 To 100) * 1			
<b>Pressure Shock Counter</b>	<b>Index 82</b>	<b>Subindex 0</b>	<b>IntegerT (32 Bit)</b>	<b>ReadOnly</b>
Small unexpected valve movements (0,2 - 0,4mm movement within 0,5s, Event #32)				
<b>Factory setting</b>	<b>0</b>			
Value range	(0 To 2000000)			
<b>SV-activations</b>	<b>Index 83</b>	<b>Subindex 0</b>	<b>RecordT (96 Bit)</b>	<b>ReadOnly</b>
Number of solenoid valve activations				
SV1		Subindex 1	IntegerT (32 Bit)	
Number of SV 1 activations				
<b>Factory setting</b>	<b>0</b>			
Value range	(0 To 2000000) * 1			
SV2		Subindex 2	IntegerT (32 Bit)	
Number of SV 2 activations				
<b>Factory setting</b>	<b>0</b>			
Value range	(0 To 2000000) * 1			



## 8 Diagnosis

SV-activations	Index 83	Subindex 0	RecordT (96 Bit)	ReadOnly
SV3		Subindex 3	IntegerT (32 Bit)	
Number of SV 3 activations				
<b>Factory setting</b>	<b>0</b>			
Value range	(0 To 2000000) * 1			

SV-ON_time	Index 84	Subindex 0	RecordT (96 Bit)	ReadOnly
Total ON time of solenoid valves				
SV1		Subindex 1	IntegerT (32 Bit)	
Total ON time of SV 1				
<b>Factory setting</b>	<b>0</b>			
Value range [min]	(0 To 2000000) * 1			
SV2		Subindex 2	IntegerT (32 Bit)	
Total ON time of SV 2				
<b>Factory setting</b>	<b>0</b>			
Value range [min]	(0 To 2000000) * 1			
SV3		Subindex 3	IntegerT (32 Bit)	
Total ON time of SV 3				
<b>Factory setting</b>	<b>0</b>			
Value range [min]	(0 To 2000000) * 1			

Setup Type	Index 67	Subindex 0	UIntegerT (8 Bit)	ReadOnly
Type of current setup				
Value range	0 1 2 3	(No Setup) (Auto Setup) (Live Setup) (Flex Setup)		

Valve Type	Index 66	Subindex 0	UIntegerT (8 Bit)	ReadOnly
Detected or configured valve type				
Value range	0 1	(Rotary valve) (Seat valve)		

Setup Position Data (DeEn)	Index 110	Subindex 0	RecordT (32 Bit)	ReadOnly
Data for position in current setup				
Pos De-En		Subindex 1	UIntegerT (16 Bit)	
Target switchpoint (De-Energize)				
Value range [mm]	(0 To 1060) * 0.1 32764	(NoData)		
Switchpoint logic		Subindex 2	BooleanT	
Value range	0 1	(High active) (Low active)		
Switchpoint hysteresis		Subindex 3	UIntegerT (8 Bit)	
Value range	3			

Setup Position Data (Main)	Index 111	Subindex 0	RecordT (48 Bit)	ReadOnly
Data for position in current setup				
Pos Main		Subindex 1	UIntegerT (16 Bit)	
Target switchpoint (Main)				
Value range [mm]	(0 To 1060) * 0.1 32764	(NoData)		



## 8 Diagnosis

Setup Position Data (Main)	Index 111	Subindex 0	RecordT (48 Bit)	ReadOnly
Switchpoint logic		Subindex 2	BooleanT	
Value range	0 1	(High active) (Low active)		
Switchpoint hysteresis		Subindex 3	UIntegerT (8 Bit)	
Value range	3			

Setup Position Data (Usl)	Index 113	Subindex 0	RecordT (32 Bit)	ReadOnly
Data for position in current setup				
Pos Usl		Subindex 1	UIntegerT (16 Bit)	
Target switchpoint (Usl)				
Value range [mm]	(0 To 1060) * 0.1 32764	(NoData)		
Switchpoint logic		Subindex 2	BooleanT	
Value range	0 1	(High active) (Low active)		
Switchpoint hysteresis		Subindex 3	UIntegerT (8 Bit)	
Value range	3			

Setup Position Data (Lsp)	Index 112	Subindex 0	RecordT (32 Bit)	ReadOnly
Data for position in current setup				
Pos Lsp		Subindex 1	UIntegerT (16 Bit)	
Target switchpoint (Lsp)				
Value range [mm]	(0 To 1060) * 0.1 32764	(NoData)		
Switchpoint logic		Subindex 2	BooleanT	
Value range	0 1	(High active) (Low active)		
Switchpoint hysteresis		Subindex 3	UIntegerT (8 Bit)	
Value range	3			

Setup En-stroke	Index 85	Subindex 0	RecordT (96 Bit)	ReadOnly
The stroke durations pr solenoid valve (energizing direction)				
SV1 (main)		Subindex 1	IntegerT (32 Bit)	
Stroke duration, SV 1 (energizing)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			
SV2 (USL)		Subindex 2	IntegerT (32 Bit)	
Stroke duration, SV 2 (energizing)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			
SV3 (LSP)		Subindex 3	IntegerT (32 Bit)	
Stroke duration, SV 3 (energizing)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			

Setup DeEn-stroke	Index 86	Subindex 0	RecordT (96 Bit)	ReadOnly
The setup stroke durations pr solenoid valve (de-energizing direction)				





## 8 Diagnosis

Setup DeEn-stroke	Index 86	Subindex 0	RecordT (96 Bit)	ReadOnly
SV1		Subindex 1	IntegerT (32 Bit)	
Stroke duration, SV 1 (de-energize)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			
SV2		Subindex 2	IntegerT (32 Bit)	
Stroke duration, SV 2 (de-energize)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			
SV3		Subindex 3	IntegerT (32 Bit)	
Stroke duration, SV 3 (de-energize)				
<b>Factory setting</b>	<b>0</b>			
Value range [ms]	(0 To 100000) * 1			

BLOB ID	Index 49	Subindex 0	IntegerT (16 Bit)	ReadOnly
The durations of the latest strokes and the latest events can be exported as data files				
<b>Factory setting</b>	<b>0</b>	<b>(Idle)</b>		
Value range	0	(Idle)		
	-4096	(Diagnostic log)		
	-4099	(Stroke durations)		

## 9 Events

Code	Device status	PQ*	Class	Name	Description
0x4210 16912d	2 (Out of specification)	valid	Warning	Device temperature over-run	Clear source of heat
0x4220 16928d	2 (Out of specification)	valid	Warning	Device temperature under-run	Insulate device
0x5010 20496d	3 (Functional check)	valid	Error	Component malfunction	Repair or exchange
0x5111 20753d	2 (Out of specification)	valid	Warning	Primary supply voltage under-run	Check tolerance
0x8DFE 36350d	1 (Maintenance required)	valid	Warning	Test Event 1	Event appears by setting index 2 to value 240, Event disappears by setting index 2 to value 241
0x8DFF 36351d	1 (Maintenance required)	valid	Warning	Test Event 2	Event appears by setting index 2 to value 242, Event disappears by setting index 2 to value 243



Events are raised by the device itself to notify irregular device states  
PQ\* = Process data quality

## 10 Error types

Code	Name	Description
0x8000 32768d	Device application error - no details	Service has been refused by the device application and no detailed information of the incident is available
0x8011 32785d	Index not available	Access occurs to a not existing index
0x8012 32786d	Subindex not available	Access occurs to a not existing subindex
0x8020 32800d	Service temporarily not available	Parameter is not accessible due to the current state of the device application
0x8023 32803d	Access denied	Write access on a read-only parameter
0x8030 32816d	Parameter value out of range	Written parameter value is outside its permitted value range
0x8033 32819d	Parameter length overrun	Written parameter length is above its predefined length
0x8034 32820d	Parameter length underrun	Written parameter length is below its predefined length
0x8035 32821d	Function not available	Written command is not supported by the device application
0x8036 32822d	Function temporarily unavailable	Written command is not available due to the current state of the device application
0x8040 32832d	Invalid parameter set	Written single parameter collides with other actual parameter settings
0x8041 32833d	Inconsistent parameter set	Parameter inconsistencies were found at the end of block parameter transfer, device plausibility check failed
0x8082 32898d	Application not ready	Read or write service is refused due to a temporarily unavailable application



Error types are used for the ISDU response. Values unequal '0' indicate the cause of a failed ISDU read or write service.